

The present invention relates to a method, a system and a mail server for sending of an electronic mail. Said method comprises the steps of contacting a service provider (12) of the electronic mail services and subsequently starting a client program in order to communicate with the mail service (13). The user (4) drafts a message, determines a destination of the message and sends the message to the destination. The message is received at the mail service server, which forms necessary fields into the message, asks an A-number information corresponding the IP address from an exchange (1), provides the A-number information with the mail server information and forwards the message to the destination.

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Electronic MailField of the invention

5 The present invention relates to electronic mail, and more particularly to an electronic mail system and method adapted to operate in an interlinked relationship with a telephone system and further to an electronic mail server.

10

Background of the invention

Letters, telephones, radio connections, telexes and facsimile machines have been used as primary means for  
15 communicating and exchanging information between persons at distant locations. Nowadays, however, with increasing processing capabilities and decreasing prices of computers, a computer networking has been developing rapidly, and an use of electronic mail (e-mail) kind of  
20 computer based service has gained increasing popularity. The Electronic Mail (email) is a system whereby a computer user can exchange messages with other computer users (or groups of users) via a communications network. The Electronic mail is one of the most popular uses of  
25 the Internet. Individual users communicate by using application programs, such as electronic mail, Telnet and FTP. The Electronic mail has also found widespread use in offices and homes and also therebetween, as it has an access to the services provided by the  
30 communications network, via e.g. telephone network and Internet. The E-mail has the advantage that messages can be sent like letters but in an electronic form at any convenient time. The receiver can then view the message in any appropriate time.

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Information transmitted by the email is visually recognisable information like a letter. The e-mail is mainly provided by two main parts, i.e. Header and Body fields. A part of the information received in the mail message header part depends on the service provider and/or the operator and/or the used programs. The user can configure a certain part of the information the user/service provider/operator wants to send within the message header and what will be shown to the receiver.

### Summary of the invention

The information in the header field contains the originating server name but not the sender information of the host name, i.e. the name of the computer. It does not say anything to the receiver as he/she is not familiar with the host names as such. They are usually received by the mail system. E.g. in case of dynamic address allocation the sender can get an artificial host name depending on the IP address the user gets. Especially this has been recently enhanced as the number of the IP addresses in use is limited. Thus it is possible for a person to stay unknown or anonymous when sending the messages or at least there can be hundreds or thousands of users who can use the same IP addresses. This has been a problem as the messages may contain information which might only block the mail boxes or can include "forbidden" or "illegal" information. Also other reasons exist for the need of obtaining more precise sender information. Therefore it is necessary to know the sender information better. Also, even in case there is a more precise information of the sender, it would be advisable to have some further information e.g. in order to be able to contact the sender.

Therefore, it is an object of the invention to provide a new system and a method for the mail receivers and/or the communications system to identify the sender information of the mail.

5

It is a further object of the invention to provide a system and a method which uses the A-number information in the mail system as identification information received from the number which originated the call.

10 It is another object to form an unique and informative communications system.

The present invention discloses a method and a system to use an electronic mail system as a part of an  
15 interactive system which the users can easily reach and in which the contact sender information is shown in a simple manner.

According to a first aspect of the present invention  
20 there is provided a system for communicating between computer terminals by means of electronic mail, the system comprising:

a plurality of terminals coupled together through at least one data communications network; and

25 a plurality of electronic mail servers located in the data communications network and arranged to route electronic mail messages between said terminals, each mail server being arranged to append to a received electronic mail message an identifier identifying a  
30 server from which the message was last transmitted,

wherein for a given mail message the first mail server in the transmission route is arranged to append to the message a fixed identifier which uniquely identifies the originating terminal.

35

According to a second aspect of the present invention there is provided a method of communicating between computer terminals by means of electronic mail, the method comprising routing electronic mail messages  
5 between two terminals coupled to a data communications network, wherein each mail server appends to a received electronic mail message an identifier identifying the server from which the message was last transmitted, and wherein for a given mail message the first mail server  
10 in the transmission route appends to the message a fixed identifier which uniquely identifies the originating terminal.

According to a third aspect of the present invention a  
15 system for communication between terminals by means of an electronic mail is provided, wherein the system comprises a plurality of terminals connected through at least one network and at least one electronic mail service providers' server via which the electronic mail  
20 is used by the terminals as the messages are delivered between two or more terminals, said messages including at least two parts from which one part contains information of the server(s) the messages visited during the transmission, and means for identifying the sender  
25 terminal on basis of information about the telephone number from which the sender terminal initiated the connection.

According to a fourth aspect of the invention there is  
30 provided a method of sending of an electronic mail is provided, said method comprising the steps of contacting a service provider of the electronic mail services, starting a client program in order to communicate with the mail service, drafting a message, determining a  
35 destination of the message, sending the message to the destination, receiving the mail into a mail service

server, forming necessary fields into the message, asking an A-number information corresponding the IP address from an exchange, providing the A-number information with the mail server information, and  
5 forwarding the message to the destination.

According to a fifth aspect of the present invention there is provided a mail server for delivering an electronic mail between at least two terminals in a  
10 communication system. Said mail server comprises means for receiving the mail through the communication system into the mailserver, means for forming necessary fields into the message, means for asking an A-number information of the sender of the mail corresponding the  
15 IP address of the sender from an exchange of the communications system, means for providing the A-number information with the mail server information, and means for forwarding the message to the destination.

20 The invention provides an easy and reliable manner for obtaining precise information about the actual sender of a message. The arrangement is such that the message may be transmitted through various mail servers, and still the information about the origin of the message is still  
25 available.

The above disclosed and other objects, features and advantages obtained by the invention will become evident from the following description of the exemplifying  
30 embodiments of the present invention when taken together with the annexed drawings.

#### Brief description of the drawings

35 Figure 1 shows an example of a network comprising electronic mailing system.

Figure 2 shows a flow diagram of the functional steps of the invention.

- 5 Figure 3 shows an example of the header part of the message form which may be displayed to the receiver.

#### Detailed description of the drawings

- 10 Referring now to the Figure 1, a block diagram of a part of a public switched telephone network (PSTN) is disclosed comprising a plurality of local exchanges 1 and a plurality of transit exchanges (not shown). The local exchanges and the transit exchanges are
- 15 interconnected with each other by trunklines (not shown). The trunk lines also provide interconnections between the local exchanges 1 and the transit exchanges themselves. Each local exchange 1 is also connected to a plurality of subscribers 4, 5 via subscriber lines 6.
- 20 Although only two subscribers 4, 5 are shown to be the users of the electronic mail, it will be understood that many more subscriber connections are supported at each local exchange or transit exchange, respectively.
- 25 At least one local exchange 1 and/or transit exchange is connected to the Internet 10 via an Access server 11 having interfaces to work towards the users 4 and to the data communications network 10 for connecting the user 4 to the data communications network, e.g. the Internet
- 30 10, e.g. through an Internet service Provider 12 connected to the mail server 13 or the like by a data transmission link 18. There are connections 17 (e.g. Ethernet) from the LAN (Local Area Network) of ISP (Internet Service Provider) 12 or the connections are
- 35 through a fixed connection from LAN network 15 of the company to the Domain Name Server 19 (DNS). A domain is



a hierarchically structured global character string address of a host computer in the mail system.

The desired destination of the user 4, 5 is reached  
5 through the Internet service provider 12 which can be connected through the telephone exchange 1 and is having an access to the Internet 10. Although only one exemplifying LAN arrangement 14 having multiple users (not shown) and two users 4, 5 connected through the  
10 Internet service provider 12 and through provider's LAN arrangement for accessing the Internet 10 are shown, it will be understood that many more users could be supported by the exchanges 1 and the Internet service providers 12 which are connected further by the routers  
15 16 to the Internet 10.

The subscribers 4, 5 have each a terminal for communication. It will be recognised that the operations are basically the same for communication between three  
20 or more users. The Mailbox is included in the mail server 13. The Mailbox normally consists of the host and user specifications. The standard mailbox naming convention is defined to be "user@domain". Additionally, the Mailbox can be "container" in which the mail is  
25 stored, usually only temporarily. The electronic mail server 13 comprises a central processing unit (CPU) for processing the tasks of the mail system, a terminal interface and a storage.

30 In the FIG. 1 the personal computer 4 is logged in to the electronic mail server 13 via the network arrangement 14. FIG. 2 is a basic flowchart illustrating the sequence of operations performed in each terminal 4 for communication with the electronic mail server 13.  
35 Usually the service provider 12 is arranged between the exchange 1 and the data network 10, which provides the

connections to e.g. the home user 4 and to which the mail server 13 is connected through the service provider's LAN17.

5 Only two service providers 12 and two mail servers 13 are shown, but it is understood that there might be a number of corresponding providers and servers which can communicate with each other. Each terminal 4 goes through the operations shown in FIG. 2 to display the  
10 mail addressed to the terminal etc. The operating procedure is known to the user from the principles thereof. It is evident that many other users, terminals, and telephones can be connected to the system and that also they can use the system and method of the  
15 invention.

A diagram in FIG. 3 shows an example of the electronic mail document format which is read by the receiver 5 after the user 4 has sent the message and the receiver  
20 has retrieved the message. The electronic mail message of this format is made up of a header and a text, the header of FIG. 3 consisting of a "From" field indicating the originator, a "To" field indicating the addressee, a field indicating the date and clock, "Message ID" field  
25 indicating the electronic mail ID (identity), and a "Reference ID" indicating the related electronic mail ID. Other fields are also possible and other fields can be added. Some fields are not visible to the user but only to the mail system. E.g. such a field like  
30 "Received:" comprising a local host name and server name, for example "xxxx@lmf.ericsson.fi". Even though it might not be shown to the user, it contains information which cannot be manipulated by the user as it is received from the communications system. Because of this  
35 it is valuable when identifying the origin of the mail as the user cannot affect to that field.

The email address is e.g. the domain-based or UUCP address that is used to send electronic mail to a specified destination. UUCP was initially a program run  
5 under the UNIX operating system that allowed one UNIX system to send files to another UNIX system via dial-up phone lines. Today, the term UUCP is more commonly used to describe such large international network which uses the UUCP protocol to pass news and electronic mail.

10

In FIG. 3 the Received field: from 76643 white39 (local host) by lmf.ericsson.fi means that "white39" is the host name of the terminal 4, which the system has changed in the inverse table of the DNS from the IP  
15 address to the corresponding host name. The number "76643" is the telephone number retrieved from the telephone exchange in that specific call connection. It is dynamically changed in the inverse table.

"lmf.ericsson.fi" describes the name of the mail server  
20 13. Next Received field contains information: from lmf.ericsson.fi by lme.ericsson.se. This information is added by the mail server 13 of the receiver 5. When the receiver reads his/her messages a further field can be added as Received: from lme.ericsson.se by POP, which  
25 means the server name and the protocol name post office protocol (POP) which is used for reading the mail messages from the mail server 13.

An example for an model for the inverse table of the DNS of one Internet service provider is shown in the  
30 following table:

Table

	IP address	Host name	Telephone number
	121.160.32.1	white1	93217
	121.160.32.2	white2	93345
5	121.160.32.3	white3	93171
	.		
	.		
	.		
	121.160.32.39	white39	76643
10	.		
	.		

The table contains the information about the IP addresses in use by the service provider and the corresponding host names. The telephone number can be added as one alternative in the table. Instead of changing the host name, the telephone number (A-number) is taken into the field or with the host name as in FIG. 3 (76643).

Domain Name System (DNS) is a general purpose distributed, replicated, data query service. The principal use thereof is the lookup of host IP addresses based on host names and vice versa in order to send the mail to the right destination. The style of host names presently used in the Internet is called "domain name", because they are the style of names used to look up anything in the DNS. Some important domains are: .COM (commercial), .EDU (educational), .NET (network operations), .GOV (U.S. government), and .MIL (U.S. military). Most countries do also have a domain of their own. For example, .US (United States), .UK (United Kingdom), .AU (Australia).

A mail server is a software program that distributes files or information in response to requests sent via

the email. Internet related examples include Almanac and netlib. The mailserver sends the received mails according to certain time slots but also immediately when it has received the command. As an example, Simple

5 Mail Transfer Protocol (SMTP) is a protocol commonly used to transfer the electronic mail between computers. It is a server-to-server protocol, so other protocols are used to access the messages, e.g. such as the post office protocol (POP). The referred SMTP is closely

10 described in the IETF standard RFC 821. The SMTP design is based on the model of the communication: as the result of a user mail request, the sender-SMTP establishes a two-way transmission channel to the receiver-SMTP. The receiver-SMTP may be either the

15 ultimate destination or an intermediate. SMTP commands are generated by the sender-SMTP and sent to the receiver-SMTP. SMTP replies are sent from the receiver-SMTP to the sender-SMTP in response to the commands. In the receiver-SMTP process the mail is transferred in co-

20 operation with a sender-SMTP process. It waits for a connection to be established via the transport service. It receives the SMTP commands from the sender-SMTP, sends replies, and performs the specified operations. In a sender-SMTP process the mail is transferred in co-

25 operation with a receiver-SMTP process. A local language may be used in the user interface command/reply dialogue. The sender-SMTP initiates the transport service connection. It initiates the SMTP commands, receives, replies, and governs the transfer of the mail.

30 The transmission channel can be a full-duplex communication path between a sender-SMTP and a receiver-SMTP for the exchange of commands, replies and mail text.

35 Referring to FIG. 2, when the user e.g. from home wants to use mail services he/she has (step 21) to establish a

connection to the service provider by calling to the service provider's number, whereafter Point-to-Point Protocol is used for setting up the connection. In step 22 he/she starts the client program which usually is already in his own computer. He/she starts the program, and in step 23 writes the message, gives the destination address ("fills in" name and domain name) in step 24 and clicks the send-button in step 25.

As already explained, the message comprises two parts, the header part and body part. The header consists of all of the text lines from the first line until a blank line, as illustrated in the example of FIG. 3. The body is everything following the first blank line up to the end of the file comprising the "real" message the user wants to send. The first blank line is a part of neither. The header contains the information of the e-mail address of the sender, which e-mail address is composed of two parts, namely the user account and the mail server name, i.e. the ultimate destination host as well as the destination mailbox name, e.g.

john.melen@ericsson.AU. The email address of the receiver consists of user account or an alias name and mail server address and message-ID and one or more optional fields.

It is possible that there are many servers between the sender and receiver. It is possible to find from the Header part a so called Received field e.g. from xxxxx by vvvvvvv including every hop the mail system does from every visited server. The user cannot influence this information, but it is added by every server used in the transmission. Earlier when the fixed addresses were used this information told what was the computer from which the message was sent. Nowadays, when dynamic address allocation is used more and more for this kind of connection, it is impossible afterwards or at least very

difficult to trace who really used the certain address at the time the message was sent.

The used program establishes a SMTP connection to the mail server, step 26. Usually the user needs to call to the Internet service provider with whom he has the agreement and which manages the addresses of email addresses in his mail server or servers (The ISP can have many mail servers which are arranged e.g. in a hierarchical order. Thus, as the user is sending something, the message will go through many mail servers and also through mail servers of other ISPs.) The mail server generates then so called "received" - field which includes the name of the client behind which the working station is and the mail server name, step 27. However, this information might not be extremely valuable, as the message sender may be who one else accessed to the mail server from e.g. the telephone exchange or the service provider client, especially when the dynamic allocation is concerned. The origin of the sender might be known only from the field "user name" which is configurable by the user.

However, the call connection makes it possible to use the calling number (A-number) information as an identification of the mail sender so that the information of the IP address and telephone number are updated when the call is connected, either by means of the telephone exchange or a computer program asking for the number. The mail server may ask for the number from the telephone exchange. The IP address and said telephone number are dynamically combined. Thus the actual telephone number is known by the telephone exchange in step 28. It is also useful to have a fixed IP address. Then the user has always the same IP address which always corresponds the same telephone number. The

allocation information is sent to the mail server as a request having now the information of the telephone number which informs from which telephone address the message has been sent. The telephone number of the sender (host) can be added to the received -field, or it can be saved in the mail server for proper use so that the IP (Internet Protocol) address and the respective telephone number is identified, step 29. In one alternative the telephone number can also replace the host name. Finally, the message is sent to the final destination, step 30.

This system is very useful as the IP addresses are changed dynamically and the IP address cannot specify the user, and thus, when combining the above data, the inventive system can recognise the user in a similarly safe way as in the telephone network. The A-number 76643 of the user 4 is put e.g. in the place of "white39" in the mail information. When call connection is concerned and the user is identified by the fixed or dynamically allocated IP address, the host name information is changed or connected or replaced by the A subscriber identification. The A subscriber information, i.e. the user 4 is the phone number from which the connection has occurred and from which the E-mail is then sent. This function thus makes it possible to trace the E-mail sender independently on the fields the user could manipulate or change.

It will further be understood that the connection to the network can be taken also from a mobile terminal MS connected to the computer via air interface and using a base station BS and mobile switching centres MSCs, as is shown in figure 1. The respective transmission links are arranged between those devices. There is also a transmission link connection between the afore mentioned



mobile switching centre and the exchanges 1. Thus the invention is not limited only to the fixed network services.

- 5 The telephone number may also be placed in the host name field.

- It will be appreciated by persons of skill in the art that various modifications may be made to the above
- 10 described embodiments without departing from the scope of the present invention. For example, rather than identifying the originating terminal using the terminal's A-number, some other fixed identifier may be used (by "fixed" is meant here that the user does not
- 15 have the possibility to change the identifier). For example, instead of the A-number, a user log-on username may be included in the mail message header part.

Claims

1. A system for communicating between computer terminals by means of electronic mail, the system  
5 comprising:  
    a plurality of terminals coupled together through at least one data communications network; and  
    a plurality of electronic mail servers located in the data communications network and arranged to route  
10 electronic mail messages between said terminals, each mail server being arranged to append to a received electronic mail message an identifier identifying a server from which the message was last transmitted,  
    wherein for a given mail message the first mail  
15 server in the transmission route is arranged to append to the message a fixed identifier which uniquely identifies the originating terminal.
2. A system according to claim 1 and comprising  
20 transmission means for transmitting said fixed identifier to said first mail server from either the originating terminal or from a communication node connecting the originating terminal to said first mail server, the transmission of the fixed identifier being  
25 separate from the transmission of the mail message.
3. A system according to claim 2 and comprising a telephone network arranged to couple the originating terminal to said data communications network, said  
30 communication node being an exchange of the telephone network and said fixed identifier being the connection point (A-number) of the originating terminal to the telephone network.
- 35 4. A system according to claim 2, wherein said fixed identifier is a username allocated to the originating

terminal and entered by a user as part of a log-on stage.

5. A method of communicating between computer terminals by means of electronic mail, the method comprising routing electronic mail messages between two terminals coupled to a data communications network, wherein each mail server appends to a received electronic mail message an identifier identifying the server from which the message was last transmitted, and wherein for a given mail message the first mail server in the transmission route appends to the message a fixed identifier which uniquely identifies the originating terminal.

15 6. A system for communication between terminals by means of an electronic mail, wherein the system comprises a plurality of terminals connected through at least one network and at least one electronic mail server of a service provider via which the electronic mail is used by the terminals as the messages are delivered between two or more terminals, said messages including at least two parts from which one part contains information of the server(s) the messages visited during the transmission, and means for identifying the sender terminal on basis of information about the telephone number from which the sender terminal initiated the connection.

30 7. A system as claimed in claim 6, wherein the sender terminal information is the telephone number an exchange of the used network has an inlet for a subscriber line.

8. A system as claimed in claim 6, wherein the electronic mail connection is made by a call connection through an exchange of the telephone network, the

information of the IP address and the telephone number are updated as the call is connected either by means of a telephone exchange or a computer program asking for the number, the telephone number of the caller

- 5 corresponding the IP address is sent to said mail server as a request, whereafter said mail server is provided with the information of the telephone number which informs from which subscriber line the message was sent.

- 10 9. A method for sending of an electronic mail, said method comprising the steps of: contacting a service provider of the electronic mail services, starting a client program in order to communicate with the mail service, drafting a message, determining a destination  
15 of the message, sending the message to the destination, receiving the mail into a mail service server, forming necessary fields into the message, asking an A-number information corresponding the IP address from an exchange, providing the A-number information with the  
20 mail server information, and forwarding the message to the destination.

10. A method as claimed in claim 9, wherein said method further comprises a step of combining the IP  
25 address and the telephone number information during the call connection.

11. A method as claimed in claim 9, wherein said method further comprises a step of locating a sender  
30 host by means of the telephone number information.

12. A method as claimed in claim 9, wherein said method further comprises a step of replacing a sender host name with the telephone number of the sender.

13. A method as claimed in claim 9, wherein said method further comprises a step of providing the header part of the message with the telephone number received from the exchange.

5

14. A method as claimed in claim 9, wherein the A-number is in a host name field.

15. A mail server for delivering an electronic mail  
10 between at least two terminals in a communication system, said mail server comprising means for receiving the mail through the communication system into the mail server, means for forming necessary fields into the message, means for asking an A-number information of the  
15 sender of the mail corresponding the IP address of the sender from an exchange of the communications system, means for providing the A-number information with the mail server information, and means for forwarding the message to the destination.

1/2

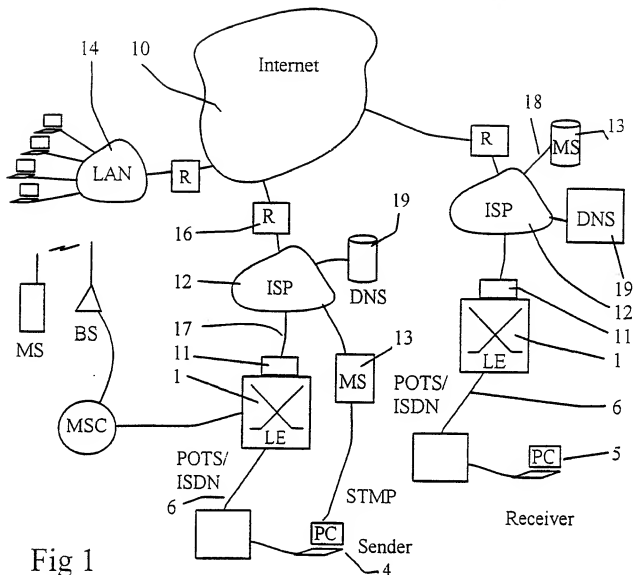


Fig 1

Received: from lme.ericsson.se by POP

Received: from lmf.ericsson.fi by lme.ericsson.se

Received: from 76643 white39 (local host) by lmf.ericsson.fi

Reference: idBB11177; thu, 8 May 1997 10:26:39 +0300

Sender: xxx @lmf.ericsson.fi

MessageID: 23232.88 @lmf.ericsson.fi

Fig 3

FROM: xxxx @lmf.ericsson.fi

TO: xxxxx @lmf.ericsson.se

2/2

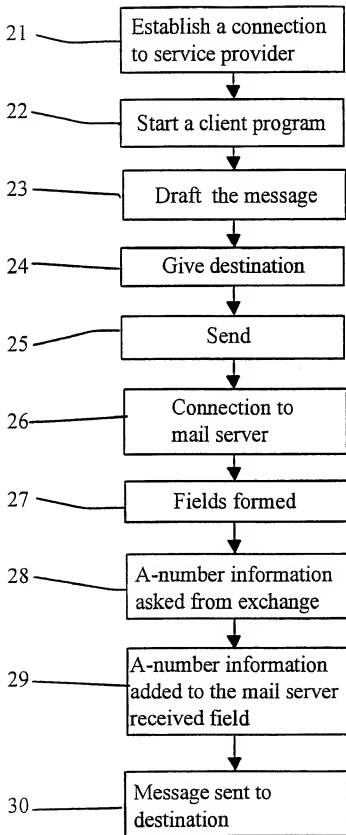


Fig 2

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[illegible]

The present invention relates to a method, a system and a mail server for sending of an electronic mail. Said method comprises the steps of contacting a service provider (12) of the electronic mail services and subsequently starting a client program in order to communicate with the mail service (13). The user (4) drafts a message, determines a destination of the message and sends the message to the destination. The message is received at the mail service server, which forms necessary fields into the message, asks an A-number information corresponding the IP address from an exchange (1), provides the A-number information with the mail server information and forwards the message to the destination.



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BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon			PL	Poland		
CN	China	KR	Republic of Korea	PT	Portugal		
CU	Cuba	KZ	Kazakhstan	RO	Romania		
CZ	Czech Republic	LC	Saint Lucia	RU	Russian Federation		
DE	Germany	LI	Liechtenstein	SD	Sudan		
DK	Denmark	LK	Sri Lanka	SE	Sweden		
EE	Estonia	LR	Liberia	SG	Singapore		

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00574

## A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04L 12/58

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04L, H04M, H04Q, G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPIL, EDOC

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5493564 A (JOHN A. MULLAN), 20 February 1996 (20.02.96), column 8, line 13 - column 11, line 66, claims 1-22  --	1-15
A	US 5590178 A (MASAHICO MURAKAMI ET AL), 31 December 1996 (31.12.96), column 2, line 17 - column 3, line 42, claim 1  --	1-15
A	US 5483352 A (NORIYUKI FUKUYAMA ET AL), 9 January 1996 (09.01.96), column 2, line 50 - column 4, line 50; column 8, line 41 - column 10, line 26, claims 1-16  --	1-15

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "B" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family
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Date of the actual completion of the international search	Date of mailing of the international search report 01-02-1999
28 January 1999	
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Erik Johannesson Telephone No. +46 8 782 25 00

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 98/00574

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0606720 A2 (AT & T CORP), 20 July 1994 (20.07.94), column 3, line 47 - column 5, line 28; column 7, line 24 - column 8, line 12  --	1-15
A	US 5537543 A (TUTOMO ITOH ET AL), 16 July 1996 (16.07.96), claims 1-26, abstract  --	1-15
P,A	US 5768505 A (FRANK WILLIAM GILCHRIST ET AL), 16 June 1998 (16.06.98), claims 1-92  -- -----	1-15

## INTERNATIONAL SEARCH REPORT

Information on patent family members

21/12/98

International application No.

PCT/FI 98/00574

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
US	5493564	A	20/02/96	NONE		
US	5590178	A	31/12/96	JP	7099508 A	11/04/95
US	5483352	A	09/01/96	JP	2756392 B	25/05/98
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				US	5434914 A	18/07/95
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				US	5481698 A	02/01/96
				JP	6149693 A	31/05/94
US	5768505	A	16/06/98	CN	1159033 A	10/09/97